Raytheon

Raytheon Six Sigma

Lessons Learned from a Software R6σ Project
V-22 Mission Planning System Software

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Description of Project and Goals

- RTSC Indianapolis S/W Engineering Department moving towards CMM Level IV
- V-22 Mission Planning System (VMPS) S/W a key project
- Use the Raytheon Six Sigma (R6σ) process to:
  - Verify process gaps identified previously via interim CMM profile assessment
  - Identify actions to alleviate gaps
  - Implement actions

Raytheon R6σ Methodology

- Visualize
  - Future: RTSC Indianapolis S/W Engineering at CMM Level IV
  - Current: VMPS not executing at CMM Level III
  - Strategy: Establish a framework for the VMPS project to understand and appropriately use key processes
- Commit
  - Sponsorship
  - VMPS team buy-in
  - R6σ cross-functional team committed

Raytheon R6σ Methodology, continued

- Prioritize
  - Chart the results from the CMM interim profile assessment by key process area and rank
  - Determine which KPA's to focus on
- Characterize
  - Team meetings and individual interviews to determine and document
    - validity and currency of gaps
    - root causes
    - expected improvements and plan of action

Raytheon R6σ Methodology, continued

- Improve
  - Perform the action items according to plan
- Achieve
  - Measure success with repeated interim profile assessment
  - Experience improved team performance
  - Document plan implementation and successes
  - Present results to senior management
  - Celebrate

CMM Methodology

- In R6σ Characterize phase
  - Individuals and team queried with CMM Level II/III KPA goal oriented questions for current state of project
    - new team members since interim CMM profile assessment
    - new release of software
    - new tools being used
  - Team brainstormed causes for original gaps identified in interim CMM profile assessment
  - Findings and associated actions for alleviation of gaps determined and documented in an action plan

Results

- 41 gaps classified via R6σ and SEPG-based CMM systems
  - SEPG error types - Lack of awareness, Lack of compliance, Unclear process, Inadequate process
  - R6σ error types -Correction, Over production, Motion, Material movement, Waiting, Inventory, Processing
- 89 resulting actions in plan
  - Distributed as project, SEPG, S/W Engineering, Systems Engineering, Engineering actions
- 6 big-hitters targeted for immediate attention for R6σ
  - CMM Lack of compliance = R6σ Correction type

Results, continued

- Big-hitters
  - SCM - Changes to S/W observed beyond the development stage during test
  - SPTO - Progress indicators not always available
  - IGC - CASOWs not complete for current effort
  - IGC - SEN not maintained IAW defined process and not current
  - ISM - Existing planning documents not “living”
  - RM - Lack of traceability from the SRS to the SDD

Major Lessons Learned

- Differences in CMM and R6σ approaches
  - Common: improvements in productivity, efficiency, quality, customer satisfaction
  - CMM: process focused, institutionalization to achieve goals, statistical process control at Level V
  - R6σ: customer focused, bureaucracy busting, tools and statistics to eliminate waste, begin by throwing away
  - Resolve by: setting ground rules, boundaries and assumptions at beginning of project

Major Lessons Learned, continued

- 5 of the 6 big-hitters attributed in part to departmental process differences or intergroup coordination issues; numerous of the remaining gaps likewise
  - SCM - Changes to S/W observed beyond the development stage during test
    - cause - S/W testing done by team outside of S/W. Tool used for CM not familiar to this group; no cross-training. Communication between S/W and test groups not consistent.
  - SPTO - Progress indicators not always available
    - cause - metrics and tools used by S/W clearly defined but not same as used by Systems for customer. Confusion. Lack of training and coordination.

Major Lessons Learned, continued

- IGC - CASOWs not complete for current effort
  - cause - lack of communication between Systems and S/W, inconsistent understanding of control of project and expectations of leads
- IGC - SEN not maintained IAW defined process and not current
  - cause - Systems Engineering structure and expectations different than pre-existing S/W SEN
- RM - Lack of traceability from the SRS to the SDD
  - cause - DOORs tool used for requirements at Systems level not cross-trained or readily available at S/W Engineering level

CMMI Application

- Where does CMMI come in?
  - Goes beyond the “stovepipe”
  - Focuses on enterprise processes and improvement
  - Integrated approach
  - Common terminology, style, rules, and components
  - Refines and expounds on process areas
  - Common understanding of requirements

CMMI Application, continued

- Application to the big-hitters lesson
  - Cross-training of Systems and S/W, others on tools
  - Availability of processes and tools across departments
  - Engineering level processes that flow down instead of up from S/W Engineering
  - Common understanding of lead roles, terminology
  - Improved communications through common Engineering notebook structures, meeting minutes, etc.

Conclusions

- RTSC Indy's V-22 Mission Planning System software R6σ effort highlighted issues that are typical of industry findings associated with the CMM-based process improvement efforts.
- The "gaps" found in this effort would have been fewer if enterprise process solutions had been in place and in use.
- These findings support RTSC Indy's plans to move first to S/W CMM Level IV, then to CMMI level IV for Systems and Software Engineering.